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CONTENTS

BULGARIAN-MADE PERSONAL COMPUTER DESCRIBED

Sofia TEKHNICHESKO DELO in Bulgarian 1 Jan 83 p 4

[Article by Engineer Aleksandr Yavrichev: "Bulgarian Personal Computer"]

[Text] In order to multiply a 10-digit figure by its own number 100,000 times 84 hours of work were needed in 1945; 10 hours of work were needed 10 years later; 600 milliseconds were needed 10 years after that; and no more than 50 microseconds were needed another 10 years later. Meanwhile, the size of the computers became smaller and smaller. That which computers could accomplish in the 1950s became possible to accomplish with minimachines in the 1960s and micromachines in the 1970s. Thus, at the end of the last decade personal computers appeared. A Bulgarian personal computer was exhibited at last year's autumn fair in Plovdiv.

Unquestionably, personal computers are the result of miniaturization. However, this was a necessary although an insufficient prerequisite. The new computer equipment also required new program support. To this effect miniversions of languages such as Fortran, Basic, Pascal and others were created. The software was considered as well--floppy disks, special terminals, printing and drafting systems, and so on.

The great advantage of personal computers is that they do not require expensive air conditioning systems and may be operated in ordinary premises--at the office or even the home of the owner. They do not require any particular knowledge of computer equipment, which is also of great importance in terms of their mass use. These qualities became even more tangible in the subsequent "generations" of personal computers: consoles were followed by portable models (which could be placed in a small valise of the "diplomat" type) and even in a pocket (the RS-1211 model produced by the Japanese Sharp Company has the dimensions of a bar of chocolate for children--17 by 11 centimeters). Obviously, the user of such equipment will be tied to a specific workplace less and less. He will be able to work at home, at the construction site, the shop and even while traveling.

The Bulgarian personal computer displayed at the international technical fair in Plovdiv is of the console type. Actually, this is the second variant developed by its authors--a collective headed by engineer Ivan Marangozov at the Institute of Technical Cybernetics and Robotics in Sofia. The purpose of the first was to act as a testing stone for the creation of the latter.

The basic configuration of the computer includes a microprocessor, connecting blocks with various terminals and a keyboard. The memory volume is 48K bites but may be increased to 64K bites. The computer has a separate monitor (the use of black and white or color television is possible), on whose screen the information is inscribed. It could be a text of 24 lines with 40 symbols each or an image of a maximum of 280 by 192 points. Sixteen colors may be used in the color presentation.

The computer uses programs written on the easily accessible Basic language. They may be stored in an external memory system such as a bite cassette or floppy minidisk system. This offers the possibility of creating extensive libraries containing various programs. The information carriers--the cassettes and disks--are inexpensive and small, i.e., they are easily stored. In the use of a floppy minidisk system, in addition to Basic, languages such as Pascal, Fortran, Pilot and others may be used. The computer uses two alphabets--the cyrillic and the Roman, and all comments to the programs may be made in Bulgarian.

A printer, a system for graphic information, a drafting system and converters to analogue and digital signals may be attached to the computer. The computer is powered by 220-volt 50-hertz current. Its dimensions are 480 by 400 by 180 millimeters and it weighs 8 kilograms.

All of these technical data offer a broad field for the application of the new computer. It can be used for quick and accurate computations as well as for storing and updating information. The computer can be successfully used in scientific research, education and industry, which explains the interest with which it was welcomed by specialists at the fair and, subsequently, the exhibit in the course of the Automation VIII National Practical Science Conference which was held at the Golden Sands Resort. The logical question which remains is whether production will be regular, or will the computer remain simply a nice scientific development. For the time being, the answer is promising: the production of the new personal computer is being mastered at the Instrument Manufacturing Plant in Pravets under the trade name of "Pravets '82."

5003
CSO: 2202/4

APPLICATION OF BULGARIAN MICROPROCESSOR SYSTEMS

Sofia TEKHNICHESKO DELO in Bulgarian 8 Jan 83 pp 1, 4

[Article by Engineer Petur Petrov: "Bulgarian Microprocessor Systems"]

[Text] Under the conditions of the global energy and raw material crisis production automation with a view to achieving considerable savings in labor, energy, raw materials and materials and upgrading productivity becomes particularly important. Extensive work has been done on this problem in the developed countries and the invested funds have yielded high returns. It is economically profitable for our country to develop the type of automation which will ensure a multiplication of results. The elaboration and application of microprocessor systems in industry is a strategic task. The areas of application are quite extensive and cover automation of processes in the chemical industry, machine building, power industry, timber processing, construction materials production, processing of agricultural commodities, and so on.

The Instrument-Making Institute in Sofia is doing extensive work on the creation and application of microprocessor systems. The "Programa 700" programmed controller has been developed and its production mastered. It is a microprocessor system which controls discrete processes. It replaces systems based on relay-contact equipment and offers new opportunities from the viewpoint of functionality, programming, price and reliability. One of the basic qualities of the controller is its essential orientation toward the knowledge and problems of the consumer. Regardless of the fact that it is based on a microcomputer, it requires no knowledge of computer technology nor a special programming language for its use.

Separate modules are part of microprocessor systems. The "processor" module is the central processing and controlling part of the "Programa 700." It accepts consumer programs written in the language of relay-contact systems or zero equations, processes them and services input-output modules. It performs the functions of a counter, timer, sliding recorder, logic, and so on. It has an 8-kilobite memory. The timer's range is from 0 to 1.5 minutes with a discreteness of 10.4 milliseconds, with the possibility of extension to 250 hours through multiplication with a discreteness of 1.5 minutes. The range of the counter is from 0 to 9,999. The maximal number of counters and timers is 200. The "Programator" module is used for introducing the program in the processor's memory. The functionally designed keyboard makes it possible for the programs to be introduced directly from relay-contact circuits

or zero equations without the use of a special program language. Thanks to its well-developed editing functions, the programmer makes it possible quickly to introduce, check and tune up consumer programs.

The "Programa 700" microprocessor system may be applied in a variety of production facilities as follows:

--in developing galvanic lining (the system controls the processes of processing and covering the parts and their shifting among individual tubs along the galvanizing line in accordance with technological stipulations);

--controlling interoperational transportation (a controller is undergoing tests at the Motor Vehicle Tires Plant in Vidin, controlling the transportation operations in the production of automotive vehicle tires);

--assembly lines (a microprocessor system has been attached to the assembly line for wood cutting and the Moskva Furniture Plant in Sofia);

--hydroponic greenhouses (measuring and controlling a number of data directly affecting production, such as pH, conductibility and temperature. The controls extend to the levels of the components and the nutritive solution. Such systems are being introduced jointly with the Maritsa Vegetable Crops Institute in Plovdiv in controlling hydroponic systems);

--brick baking and aligning (one controller will participate in controlling technological processes in the preparation of the materials while a second will control the baking and transportation of the bricks).

Furthermore, the system may be used in controlling the treatment stations of thermoelectric power plants, transporting solid fuel to thermoelectric power plants, controlling combined machine units, and others.

Another new development of the Instrument-Making Institute is the "Programa 1024" microprocessor system, which is part of the system of the Ministry of Machine Building and Electronics used in the automation of continuous and continuous-discrete technological processes. The design of the firm system is on three levels:

--The first is a sum total of meters and performing mechanisms which ensure direct links with the controlled project;

--The second level consists of a distribution microprocessor "Programa 1024" microprocessor system for controlling technological processes;

--The third level consists of a data mainline, and a system for controlling the main incoming data and the electronic "Izot 1016C" computer.

The "Programa 1024" processor is based on three microprocessors. It computes logical algorithms, mathematical operations with round and real figures, and algorithms for automatic control. It also trades data with other systems through the main line. A variety of terminals may be connected to the micro-

processor, such as a printer for documenting processes, a memory bank for floppy disks on which consumer programs are recorded, and a technological display for the retrieval of information data. The processor can control up to 1,024 discrete inputs-outputs, up to 64 analog inputs-outputs, up to 100 timers and 120 counters, and up to 8 PID regulators. The programmer makes it possible to edit, tune and indicate to the consumer programs, logical management and control. The programs are introduced with a problem-oriented language for a description of logical relay systems, special functions for mathematical data processing and PID regulator functions in a dialogue system. The system also includes the following modules: discrete inputs and outputs (each module has four channels and each channel has 16 series), analog results and output (changing analog signals into data code and vice versa), access to counters and timers, access to outlines (tuning and indication of variable parameters included in the consumer program for regulating in terms of real time) and a servocontrol module.

The program support makes it possible to perform the basic functions of controlling discrete processes, regulating continuous processes, providing information data to the personnel, and diagnosing the efficiency of the system. The "Programa 1024" microprocessor system was awarded a gold medal at the 1982 Plovdiv Fair.

The firm system of the Ministry of Machine Building and Electronics for the automation of continuous and continuous-discrete technological processes is being developed with the Izot DSO [State Economic Trust] and the TsNIKA as coperformers. The Izot DSO provides the "Izot 1016C" computer. The TsNIKA is the main performer and supplier of the overall engineering activities for the firm system, which includes comprehensive designing, delivery, installation, cadre training and servicing.

5003
CSO: 2202/4

COMPUTER SYSTEMS ON LINE AT HUNGARIAN RAILWAY NETWORK

Budapest SZAMITASTECHNIKA in Hungarian Oct 82 p 3

[Article by Takacs: "Railway Employees in Front of Terminals. Computers for Smooth Transport of Passengers and Goods."]

> [Text] Railways are the arteries of the country. The Hungarian railway network is more than 8,000 km long and carries 290 million passengers and 130 million tons of goods. Because of this heavy traffic the ever growing task of providing smooth railway service requires modern technology.
>
> Railways were a great invention of the past century, which have transformed social and economical conditions to an unprecedented degree. Today, computer technology plays a similar role. The meeting of the great inventions of subsequent centuries was the topic of conference and exhibition, "Computers in Railway Plant Management," organized in September by the Szeged Organ of the Traffic Sciences Association.
>
> The railways have always been eager to adopt modern technology. MAV [Hungarian State Railways] used punched card data processing equipment as early as 1927 and made preparations 10 years ago to use computers for help in registration and plant management. MAV is one of 33 companies to implement integrated computer technology developed by SZKFP [Central Development Program for Computer Technology] for the period of the sixth 5-year plan.

Participants at the Szeged conference discussed their experience with the computer systems, already under operation and current planned developments in computer technology. The emphasis was on continuity, because of the ever accelerating pace of technical development, and on gradual development because of the finiteness of available material and intellectual resources. The goal of the conference was to improve both the planning of the passenger and goods transport and the dynamics of railway plant management in order to save material, energy and labor.

In 1977 the computer technology system of MAV was reorganized. The Computer Technology Coordination Committee was established to make decisions affecting the entire railway system and to prepare developmental plans. The MAV Computer Technology Plant, which performs its tasks in decentralized units in a united spirit under central control, was set up.

The three main areas where computer technology was introduced were the border traffic information system, the Zahony automated control system and the marshaling stations.

The border traffic information system is currently operating in an experimental mode, and from 1983 in a normal mode. The system provides the border stations, railway administrations and technical management services accurate and up-to-date data on the contents, destination, technical characteristics etc all freight cars entering all the border stations of the country. The data base is located on the Budapest ES 1040 computer; an ES 1010 acts as a front-end processor, providing network control and on-line connection. The terminals and the systems were selected according to the traffic of the border stations: an ES 1032 in Zahony, a VT20 in Sturovo, on the Czechoslovak-Hungarian border, a VT 56100 in the Szeged administration in Klebia, and a Singer device on GYSEV [Gyor-Sopron-Eberfurth Railroad].

The MAV experts gained a great deal of experience during the construction of these large systems not only in setting up the software elements necessary for remote processing but also in providing the right conditions for the use of computers. They found that the success of new technology can only be achieved by carefully preparing the user environment, by solving several problems of detail such as standardizing time accounting in the railway system and regulating the relationship between the railway technical services and the computer technicians.

The activities of the Zahony automated management system also entered a decisive stage. To illustrate the magnitude of this task, the amount of information processed every day will be two million characters. The two Polish ES 1032 computers and VT 20 terminal were placed into operation. Work continues on the air conditioning equipment and the power network, as does the training of the railway employees in computers. The programming systems for the plant management users are being developed so that the experimental plant can be placed in operation by the beginning of 1983.

Because the marshaling stations have more complicated transport and control tasks, more information processing is necessary. Computers perform these tasks at several junction marshaling stations.

In Szolnok, an ES 1010 is in operation. It stores the data of the arriving trains and freight cars and prepares assignment lists, train load statements, train departure diaries etc. Because it provides up-to-the-minute information about the occupancy of the marshaling station rials, the length to stay of the cars etc, the station managers can have an accurate picture on which to base their decisions.

In Miskolc, where 2000-2500 cars are transferred every day, the MAV 51 microcomputer jointly developed by MAV and SZKI performs similar functions. The system was introduced in June 1981, and, after overcoming some initial difficulties, is now functioning at a 99.5-percent operational readiness. There is a MAV 51 system in operation in Komarom, Hegyeshalom and Hatvan. A VT20X dual processor computer (the name refers to the microprocessor disk adapter) will be placed into operation next in Bekescsaba. Each marshaling station system that is already in operation or will be developed is a link in the long-range integration of the national transport system. The first part of this system will be the line subsystem controlling and coordinating the work of marshaling stations between Budapest and Hegyeshalom.

All of these developments will result in many changes in the activities of MAV employees. Certain job assignments will cease to exist, new ones will be created and even the old assignments will undergo a qualitative change. Not only will system organizers and programmers become railway employees but traffic duty personnel and train coordinators must learn how to work on the terminals connected to the computer. Computer technology will become an integral part of railway technology. Generally, railway employees have accepted the new tools with confidence. It is worthwhile to make an interesting observation: those railway employees receiving information that assists them in their work are much more careful in entering the data accurately and completely into the system.

With the use of the computer, traffic organization has improved. The decision points have been moved closer to the processes; the length of the chain of control has been shortened, more accurate and in-depth analyses can be prepared. Manual labor has been reduced and a saving in working hours achieved.

According to realistic estimates, the local and line subsystems gradually being established will be combined into a nationally integrated transport control system by the end of the 1990s. MAV officials hope that by then those contradictions that are obvious today to all passengers will cease to exist. Although traffic controllers perform their work on computer terminals, the hard and accident-prone labor of switch and junction tenders at marshaling yards, which often involves jumping from rail to rail, has been relieved by electronics only in very few places.

9901
CSO: 2502/10

COMPUTER USE AT NUCLEAR RESEARCH INSTITUTE

Budapest SZAMITASTECHNIKA in Hungarian Nov 82 p 4

[Article by Geza Szekely and Tamas Vertse: "The Role of Computer Technology in the Work of ATOMKI"]

[Text] The Nuclear Research Institute (ATOMKI) is one of the most significant provincial institutes of the MTA [Hungarian Academy of Sciences]. Atomic physics and nuclear physics basic research have the fundamental role in the activity of the 300-man Debrecen institute. Since the founding of ATOMKI experience acquired in and practical use of other branches of science have had an important role. In recent years such activity has received even greater emphasis.

Atomic physics and nuclear physics research requires the broad assistance of computer technology. Computer technology is indispensable for experimental work, beginning with measurement and the design of measurement equipment through control of the measurements and collection and preselection of data to the evaluation of results. And theoretical work is unimaginable without computers.

From Need to Realization

The need for computer applications developed in the institute in the middle 1960's. Researchers, in addition to making use of the possibilities offered by foreign cooperation, were trying to exploit the still very modest domestic possibilities also. Beginning in 1966 they performed theoretical nuclear physics and ion optics[1] calculations on the GIER computer of the KSH [Central Statistics Office] and later on the ICT-1905 computer of the KFKI [Central Physics Research Institute]. The latter had a great role in the design of the 5 MV electrostatic accelerator prepared by the institute.

The first ATOMKI computer was the ODRA-1013 small computer put into operation in 1967. This autocode programmable, second generation computer, intended primarily for educational purposes, was far from being most suitable for carrying out the tasks arising at the institute but it played a significant role in spreading programming and computer operation expertise. The ODRA

offered good possibilities for performing calculations requiring smaller memory; larger tasks were carried out on the ICT computer of the KFKI and, beginning in 1971, on the CDC-3300 of the MTA SZTAKI [Computer Technology and Automation Research Institute of the MTA]. The 5 MV accelerator was put into operation in 1971, using a Nuclear Data 50/50 measurement and data collection system in which control tasks were performed by a PDP-8/i mini-computer. The UT 200 remote station received in 1974 improved access to the central computer of the Academy.

In 1976, after 5 years of "skirmishes", ATOMKI succeeded in getting a new computer of its own, a PDP-1/40.

It was a great advantage that with this model we could realize relatively easily on-line data traffic with the PDP-8. In 1978 we got expansions for the PDP-1/40 which made it possible to build up an institutional computer network which incorporated virtually all the more important computer technology equipment of ATOMKI--including two TPA/i small computers in addition to what has been mentioned.

The network multiplied the local computer technology capacity, but the needs increased even more. At present more than 50 researchers regularly use the PDP-1/40. At peak times, from 8 in the morning until 5 in the afternoon, it frequently happens that the existing 10 terminals are not enough. Another constant problem is the small magnetic disk capacity available. Since further expansion of the network by means of investments seemed hopeless in recent years we eased our problems somewhat with internal hardware and software developments.

On the Path of Development

The first more significant in-house development was preparation of a micro-processor controlled general purpose connection card. This serves as a basic tool for further developments; for example, it can be used to read and burn PROMs. The development of a 5 M bit per second link, connecting the PDP-1/40 and the other computers of the institute, promises to be significant.

We should mention here a few developments from the software side which might be useful on other computers with a similar configuration, independent of the profile of the institution operating the computer. The automatic recording of terminal and computer time use relieves the operators of the computer of considerable administrative work. This program package is also suitable for measuring the central unit time used by any part of any program running on the computer. In addition it contains many tools which are indispensable for studying the efficient operation of the operating system. In 1981 we prepared a system simulating a UT 200 remote station, which makes possible a direct link between the PDP-1/40 and the CDC-3300. A more optimal division of labor between the two computers is aided by this development, which ensures transmission of data files in both directions. Similarly at the end of last year, we modified the internal microprogram of the PE12F terminals, made by the KFKI, by means of which these terminals, which also have graphic properties, can be used in the RSX-11M operating system also. The INTEL 8085 and 8X300

cross assembler programs aid microprocessor developments taking place at the institute.

The group operating and developing the network maintains close contact with DECUS (the association of users of DEC computers) and its domestic organization, the DECUS HLUG (Digital Equipment Computer Users Society Hungarian Local Users Group), operating within the framework of the NJSZT [Janos Neumann Society of Computer Technology] Users Club. Researchers of the institute have participated with six domestic and two foreign presentations at symposia arranged by the organization; we continue to consider participation in the work of the organization to be very important.

The study of atomic collisions created with heavy ions is a good example of the significance of the use of computer technology in the work of the institute. The ESA-21 high resolution electron spectrometer[2] needed for this was created at ATOMKI and computer calculations had an important role in its design. A research group from the institute is now using this equipment for studies being done in the beam of the heavy ion[3] accelerator of the Dubna United Nuclear Research Institute.

A measuring system based on a TPA-1140 is being used to control the measurements and store the spectra of electrons emitted from the reaction in the 13 dispersion angles. Simultaneous recording of 13 spectra places heavy demands on the computerized measurement system, but only this makes possible more efficient use of the very expensive accelerator time.

Another example proves the importance of theoretical calculations. Careful computerized evaluation of the results of elastic proton dispersion measurements, done jointly with Soviet researchers, made possible the new discovery, meriting even international recognition, that at small energies the real strength of the proton optical potential shows an anomalously strong energy dependence. In cooperation with Oxford researchers the cause of the phenomenon was found, which required the numerical determination, with a computer, of the solution of a system of large scale linked differential equations. It must be noted that an ever greater volume of computer calculations are needed for theoretical calculations; in the future the CDC-3300 will not meet these needs either in computation speed or storage capacity.

Evaluating Spectra

The measurement evaluation computations being done at the institute consist primarily of the processing of the measured spectra of electromagnetic radiation coming from nuclear reactions or samples excited in some other way. For a computer technician such a spectrum represents a discrete, single value experimental function, generally with 4,096 values given. The sprectrum can be regarded as the superposition of the individual radiations taking place at various energies--characterizing the nuclear reactions--and of radiations arising from effects which can be considered noise from the viewpoint of the reaction. The basic task of the spectrum evaluation is the decomposition of the spectrum in the interest of being able to determine what energy and

intensity radiations arose in the course of the experiment. If the spectrum of the components in the sample is known then we can determine from this the composition of the sample. In the contrary case the discovery of unknown radiations enriches our knowledge with new data and we can win valuable information pertaining to the structure of the radiating material or the course of the process.

At ATOMKI they are measuring primarily gamma spectra.[4] The participation of the institute in the G-2 comparative action of the International Atomic Energy Agency offered a good quality base for their measurements and evaluations. A total of 98 laboratories from a number of countries have participated in this action. The distinguished position achieved here shows not only the high level of the measurement technique but also the good quality of the programs used.

The new computer method developed for processing the continuous energy gamma spectrum of internal damping radiation proved suitable for a comparative analysis of theories describing the phenomenon.

There is also need for two measurement systems to evaluate roentgen spectra.[5] In the case of one, the REA (roentgen emission analysis), roentgen irradiation is the subject to be examined, and one measures the spectrum of the characteristic roentgen radiation emitted as a result. The REA method has been used successfully to study the element composition of copper alloys, rock, water and air samples, and human hair. The results of these studies are useful in metallurgy, environmental protection, archeology, medical science, etc.

The other method which requires computer evaluation of roentgen spectra is PIXE. The characteristic roentgen radiation is excited by irradiation of the sample being studied with charged particles (protons).

Microprocessor Systems

Microprocessors have been successfully used to automate a number of measuring devices in the institute. In general these developments increase the efficiency of human work. For example, the microprocessor control and measurement system prepared for the mass spectrometer not only made age determination measurement of K-Ar (potassium-argon) substantially simpler but also doubled the precision which could be achieved here. A microprocessor system under development will automate the exhausting work of track counting[7] in solid body track detectors.[6] This digitalizes the picture which can be seen in the measuring microscope then, with the aid of a suitable program, it analyzes the digital picture obtained.

A number of microprocessor systems were developed on outside orders also. For example, on an order from the Biological Institute of the Debrecen Medical Sciences University we prepared a heart muscle analyzer and microprocessor controlled REA equipment. The latter makes possible a swift determination of the gold and copper content of samples or of the calcium content of hair samples.

The first Hungarian cyclotron laboratory, to be placed in operation in 1985, will significantly expand the experimental possibilities of ATOMKI. The MGC cyclotron will be delivered by a Soviet firm. A new measurement and evaluation system will perform measurements on the cyclotron. According to the plans the central machine of the new system will be a TPA-11440 made by KFKI. Experts from ATOMKI will have significant tasks in designing and implementing the system.

FOOTNOTES

1. Ion optics: A branch of science dealing with a determination of the course of ions, the transformation properties of electric and magnetic fields and the behavior of ion rays.

2. Electron spectrometer: A device serving to measure the energy and intensity distribution of electrons.

3. Heavy ion: An atom heavier than helium deprived of one or more of its electrons.

4. Gamma spectrum: An empirical function which gives the intensity of the gamma radiation emitted by nuclei as a function of energy.

5. Roentgen spectrum: An empirical function which gives the intensity of roentgen radiation emitted by atoms as a function of energy.

6. Solid body track detector: A small sheet of mica, glass, plactic, etc., in which one can make the local break-down in material along the tracks of charged particles into tracks of perceptible size.

7. Track counting: Determining the number of particle tracks made visible in track detectors.

8984
CSO: 2502/12

COMPUTER RESEARCH AT POLISH ACADEMY OF ECONOMICS

Budapest SZAMITASTECHNIKA in Hungarian Nov 82 p 6

[Article by Adam Kopinsky and Stefan Zajonc: "Computer Technology Research at the Oskar Lange Economics Academy, I"]

> [Text] The institute was created in 1947 with a single branch and functioned as a commercial college. In 1950 it was formed into an economics college. In 1974 it was awarded the Red Banner Medal of Labor, first degree, for its achievements in the area of science and education; it then took the name Oscar Lange Economics Academy.
>
> Today, about 8,000 students study in three branches--economics, industrial engineer-economist and control and computer technology. In this last we can find an economics cybernetics faculty, a computer technology faculty, an organization and guidance faculty, a computer center and the Scientific Research Center. The Scientific Research Center is an independent unit dealing with the design and programming of integrated automated economic guidance systems.

The first electronic computer of the institute was put into operation in 1955 in the economics cybernetics faculty. It is thanks to this that since then the interest of the institute workers in scientific research and educational applications of computer technology has increased greatly. The academy now has nine third generation large and minicomputers, largely of Polish manufacture. Of these the largest is an ESZ (Uniform Computer System) 1032 computer system. It has an operational memory of 512 K bytes and its six disk stores have 30 M bytes. The other machines of the computer center are: one ODRA-1024, four MERA-305's, one MERA-306 and two SZM-4 minicomputers.

The computer center serves the entire Economics Academy, that is, the faculties, the Scientific Research Center and the college administration. Its most important tasks are: performing calculations for scientific research for the various faculties and aiding administration connected with guidance of the institute. The patron of the computer center is the Scientific Council, which as its chief task evaluates the scientific work of the computer center, its developmental plans, the results of the work done and the reports pertaining to its activities.

Education takes place in day and correspondence branches, with or without specialization. Computer technology is used to a great degree in the course of instruction; in 1981 two thirds of the machine time of the ESZ 1032 was devoted to educational purposes. The control and computer technology branch has a close connection with the computer center by virtue of both educational and scientific research work.

Training takes place in the following specialties in the day branch of the control and computer technology branch: economic cybernetics, computer technology (informatics), data processing and accounting. In accordance with the present system of instruction in the economic cybernetics and computer technology (informatics) branches the subjects can be listed here in two groups: in the first are those subjects defined by the Ministry of Science, Higher Education and Technology (course subjects); in the second are special subjects designated by the academy, given in 240 hours. The essential thing in the course subjects is that the students get the necessary general computer technology information. For example, the course "Introduction to Computer bechnology" informs the students about the concepts used in computer technology, its theoretical foundations, the technology itself and the most important parameters for operation (in both branches the first year has 30 hours of lecture and 60 hours of laboratory practice). In the course of practice they are first introduced to the computer technology equipment of the institute and then the students do independent work with the MIRAFIN and MIRAST systems. They must learn to work with minicomputers and how to conduct a dialog with the large computer.

The purpose of the subject "Computer Programming" is to offer an opportunity to master programming in practice in the designated language.

In the economic cybernetics and computer technology (informatics) branches, within the data processing and accounting sections, and in econometrics and statistics the exercises "Computer Programming I" use the FORTRAN language (15 hours lecture and 30 hours practice). In the exercises, after becoming acquainted with the basic concepts of FORTRAN programming, the students spend 4 hours becoming acquainted with the work of the ESZ 1032 computer. They study the operation of the computer, prepare a program and learn how to correct input errors. In addition to the obligatory sessions, it is the task of every student to prepare a program independently and run it in the computer center.

This year--as an experiment--one group of students will do their work on an SZM-4 minicomputer.

Another language to be learned by students specializing in data processing and accounting is COBOL, in "Computer Programming II" (30 hours lecture and 60 hours practice). Here every student must prepare two programs in the area of data processing and run them on the ESZ 1032.

The other course subject in the data processing and accounting course is the technology of data processing (30 hours lecture). Here they can master basic information about data processing systems and certain elements of the

technology of data processing. The subject called "Designing Information Systems" (30 hours lecture and 30 hours practice) prepares the students to design various information systems.

In the computer technology and guidance branch, in addition to the course subjects, the following special subjects are offered: Designing data base technology systems (50 hours of machine time); designing interactive systems; economics of data processing; designing dialogs; information retrieval systems; computer networks; performance (efficiency) of computer systems; analyzing information systems; technology of designing minicomputer systems; use of minicomputers in accounting information systems; and developing information systems with the aid of a computer.

In the course of analyzing information systems and planning information structures the computer uses the OSKAR system.

In the non-specialized sections, that is in the organization and guidance section of the computer technology and guidance branch (second year), in the national economics branch (first year) and in the industrial engineer-economist branch (first year) a single subject is given: "Organization of Data Processing" (30 hours lecture and 30 hours practice, half in the laboratory). Here one can study operation of a computer and can perform chemical calculations on SZM-4 minicomputers.

Within the framework of the special subject titled "Organization of Data Processing" the students can become acquainted with the following themes: Organization of data processing; analysis of information systems; design of information systems; computer programming; and accounting and typical information systems.

In the non-specialized branches they teach one subject connected with computer technology (the organization of data processing), in 2 varying number of hours according to the branch. Computer communication is needed in the course of instruction in this subject also but due to the shortage of time it is possible to have only exercises introducing the work of a computer.

Instruction and scientific research work make up the chief directions of the activity of the academy. The annual average value of research done at the academy between 1978 and 1980 was twice the annual average value of the years between 1972 and 1977.

The Scientific Research Center has been in operation since 1966. Its organizational development is intensive. The center has become completely independent, but its share in the research work done at the Economics Academy reaches 50 percent (expressed in monetary value). In the past 16 years the most important scientific research work of the center has been development of the IVKAIR (industrial enterprise complex automated guidance system), done jointly with the domestic computer manufacturer. This was planned so that this system is part of the software delivered with the computer. The system was prepared primarily for machine industry purposes

and it embraces ten chief activity spheres of an enterprise: Technical preparation for production; planning and supervision of production; manpower and wage management; raw material and semi-finished goods management; sales and market research; production costs; bookkeeping; financial management; and financial accounting and analysis.

It was the task of the Scientific Research Center to provide planning work (conception, initial draft, technical draft) as a subsystem. The manufacturer did the programming in accordance with a contract.

In addition to the above the following themes have been worked up in the past period: Elements of a guidance system for a metallurgical combine; elements of a guidance system for an auto industry enterprise; an enterprise guidance system for a railway car manufacturer; an automated city guidance system; and research for the domestic trade branch.

The Scientific Research Center signed its most significant contract in the second half of 1978 to work out in full certain elements of a complex guidance system for a metallurgical combine. In this case we can distinguish three classes of part systems: Control systems; systems for guidance of production collectives; and systems for guidance of production processes. In the contract the Scientific Research Center was charged with development of the following systems in the control sphere: The KADRY system (control of manpower and wage management); the SIGMA system (guiding investments, fixed assets management and maintenance and repair of machines and equipment); and the MAGMA system (guidance of circulating assets management). These will be broken down into 10 subsystems and 32 functional modules.

A program embracing a broad scale of work to be done in the theme of the information base supplements the above.

(To be continued.)

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BULGARIAN MAGNETIC DISC, TAPE PRODUCTION

Budapest SZAMITASTECHNIKA in Hungarian Nov 82 p 9

[Article by Nedko Botev, Tihomir Topalov, Khristo A. Momerin and Vladimir Chervenakov: "Manufacture and Development in Bulgaria: Magnetic Disc and Magnetic Tape Stores"]

[Text] The magnetic disc (ZUMD) and magnetic tape (ZUML) stores manufactured in Bulgaria are used in ESZ [Uniform Computer System] and SZM [Minicomputer System] computer systems.

The 7.25 M byte ESZ 5052 was developed and introduced at the beginning of 1970 and a few years later they developed the 29 M byte capacity, 312 K bytes per second speed ESZ 5061 and the SZM 5405. They are also manufacturing in series the cassettes and tape drive units needed for minicomputers. (SZM 5400--6 M bytes--and the 12 M byte, 312 K bytes per second SZM 5410.) The equipment has a top load system (IBM 5440 type cassette); even at 1,500 and 2,400 revolutions per minute the sector arrangement of the cassettes makes possible a number of variations. Bulgarian experts have developed and are manufacturing a family of floppy disc storage units (ZUGMD): ESZ 5074 (0.4 M bytes), ESZ 5082 (double density, 0.8 M bytes), and the minidisc, the ESZ 5088 (0.1 M bytes).

The manufacture of third generation equipment meant a qualitative change in the development of large discs, thanks to the servosurface technology. Representatives of this technology are: the ESZ 5067.02 (2 x 100 M bytes), the ESZ 5066.01 (1 x 100 M bytes) and the ESZ 5067 (1 x 200 M bytes) with double density.

The information on the servosurface is used as follows: to perform HEAD LOAD operations; to produce measurement impulses (cylinder) during SEARCH operations; to observe the position of the magnetic heads moving on the RECORD READ band; to perform the TRANSFER operation; to generate the INDEX marking the physical beginning of the bands; to check the angular position of the disc pack; and to synchronize data during RECORD time.

The length and number of bands can be varied. By convention the disc pack is divided into 128 uniform sectors. Each sector is 106 bytes long.

The MFM recording technique guarantees great information density. The recording current changes by steps depending on the number of cylinders. The preliminary temporary compensation of the RECORD impulses--with optional code combinations--reduces the effect of phase distortions.

Small monitor blocks watch the sequence to be correctly executed in the several phases of main operation. The ECC 7 byte code used is recorded at the end of every take, on the basis of which any errors can be discovered; those not longer than 11 bits can be corrected also. Microdiagnostics of the entire 100/200 M byte disc subsystem takes place with special program control --in autonomous operation, or without interrupting the operation of the operating system. Its purpose is to swiftly discover and eliminate irregularities which arise.

The servosurface magnetic disc technology suitable for ESZ computers can also be used on minicomputers with a pack capacity of 80, 100 and 200 M bytes.

Two basic structures are used for ESZ computers. One provides vertical guide of the tape in the magnetic head environment. Bulgaria manufactures the following: the ESZ 5012.03 and the ESZ 5612 (with tape speed of 3 meters per second). These drive units differ from one another in their method of recording. The other basic structure provides horizontal guide of the magnetic tape, and satisfies the demands made in regard to tape speed and recording density.

The devices based on this structure are: the ESZ 5003 (speed of tape, 5 meters per second), the ESZ 5003.03 (3 meters per second), and the ESZ 5027 (3 meters per second). These tapes also differ from one another in regard to their method of recording.

Loading and removing the magnetic tapes are automatic. There are air cushions at the most critical points of the tape movement structure. The driving motor is digitally controlled. The system has vacuum guide rollers and supplementary vacuum columns. The cassette servosystem uses a vacuum generator.

With the ESZ 5027/A type product the best standards known in the world in the area of magnetic tape manufacture were achieved. The group recording method provides a density of 246 bits/mm and a speed of more than 700 K bytes per second.

The magnetic tape family developed for minicomputer systems consists of: the SZM 5300.01 (0.318 m/s and cassette diameter of 216 mm), the SZM 5302 (0.635 m/s and cassette diameter of 278 mm) and the SZM 5303 (1.14 m/s and a cassette diameter of 278 mm). These are being manufactured already. Development has been completed for the SZM 5302.01 (0.635 m/s speed), the SZM 5302.01 (1.14 m/s) and the IZOT 5007 vacuum buffered high speed (tape speed, 2 m/s) drive units.

What can the user expect from the storage units of the future?

He can expect an increase in capacity, swift information exchange and reliability, a reduction in information access time and the price per bit of information and an improvement in service and maintenance.

The chief tasks of the near future are as follows:

Hermetic sealing of the working zone of magnetic carriers and magnetic heads; the development of new, better quality magnetic heads; a decrease in the thickness of magnetic coatings and magnetic carriers; an increase in the longitudinal and transverse recording density; a decrease in access time; an increase in the speed of information exchange; and the introduction of new information coding methods.

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POLAR EXPEDITIONS, RESEARCH REPORTED

Polar Cruise to Spitsbergen

Warsaw TRYBUNA LUDU in Polish 22 Oct 82 p 4

/Text/ For the second time this year the "Perkun," an icebreaker operated by the Polish Ship Salvage and Rescue Service and under the command of captain Ziemowit Klos, set sail on 21 October on a polar cruise to Spitsbergen. The ship's cargo is equipment and supplies for the Polish Arctic research team which will spend the winter at the Polish Academy of Sciences /PAN/ on Hornsund fjord. The summer team of sicentists will be returning to Poland on board this ship along with four Spitsbergen researchers who, as was reported in the Polish press, were injured by an avalanche while studying glaciers. The "Perkun" will on its return voyage the "Perkun" will call at Gdynia in mid November 1982.

Polar Station Supply Delivery

Warsaw TRYBUNA LUDU in Polish 15 Nov 82 p 5

/Text/ On 14 November the icebreaker "Perkun" operated by the Polish Ship Salvage and Rescue Service returned to Gdynia from a three-week round trip voyage to Spitsbergen. Passengers on board included polar scientists from the group of four who were injured in September by an avalanche while studying one of the island's glaciers.

The "Perkun" delivered equipment and fresh supplies to the PAN Polish Polar Station on Hornsund fjord in southern Spitsbergen that will make it possible for this installation carry on its work during the harsh arctic winter. The research base manned by Polish polar scientists which has been in operation there for 50 years is conducting an ongoing series of various kinds of observations and scientific experiments.

Seventh Antarctic Research Expedition

Warsaw TRYBUNA LUDU in Polish 12 Dec 82 p 7

/PAP report/

/Text/ Preparations are nearing completion for the seventh Antarctic Expedition of the Polish Academy of Scientists /PAN/ which will set out in mid

January 1983 for King George Island. This expedition will be relieving the current crew manning the Arctowski Polar Station. After spending a year on the island, the Sixth PAN Antarctic Expedition was reduced, for economy reasons, to a bare minimum and numbers only 10 people. This team has made it possible to keep our polar research station there in operation and carry on the most important types of scientific research work.

The new Seventh Antarctic Expedition will be larger. It is expected that around 16 people will take part in this expedition, and this will make it possible to broaden the scope of the scientific research work under way there. It is expected that the range of natural science research projects will be broadened, including in particular biological research work at sea and on land. The scientists will be focusing their attention on marine algae, plankton, especially krill, fish, birds, and seals. Plans have also been made to carry on with meteorological observations and seismic and magnetic field measurements.

The year 1982 was a jubilee year -- the 50th anniversary of Polish polar research. Fifty years ago the first independent Polish polar expedition set out for Bear Island in the Arctic Ocean. Today our country can be proud of its extensive accomplishments in the field of arctic research which are widely respected in the scientific community.

Cutback in Antarctic Research

Warsaw TRYBUNA LUDU in Polish 6 Jan 83 p 5

/PAP report/

/Text/ On 8 January the Seventh PAN Antarctic Expedition, which will be relieving the current crew manning our polar research station on King George Island in Western Antarctica, will be departing from Gdynia on board the ship "Zawichost." As we are informed by the expedition leader, Dr Marek Zdanowski from the PAN Institute for Ecology, this year's expedition will not be very large. Thirteen persons will be taking in this expedition -- which in fact amounts to an increase of four persons over the size of the Sixth PAN Antarctic Expedition which is now coming to an end. But this is a much smaller expedition than those sent out in previous years.

The Seventh PAN Antarctic Expedition will be carrying out standard types of meteorological and geophysical research work. Plans have also been made for biological research work in order to carry on and build on the work performed by previous Polish expeditions. It is expected that this expedition will be pursuing research work in the field of marine microbiology.

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NEW ELECTROHYDRAULIC ROBOT TESTED IN CLUJ-NAPOCA

Bucharest SCINTEIA TINERETULUI in Romanian 1 Dec 82 p 4

[Article by Ioan Gavra]

[Text] At the Cluj-Napoca Polytechnic Institute, the dialectic of education-research-production unity is materialized each and every day in the superior valorization of the human and technical creativity potential. Teachers, researchers, specialists, and students combine their material and mental efforts to build technical instruments and devices at the highest level of competitiveness in today's scientific progress. Here, the automation and computerization of production, robotization in this case, is no longer a purely theoretical or modelling matter. On the contrary, it is now a practical achievement, with direct application in industrial robotics. While still in the classroom, the future researchers and specialists are already adapting future jobs to the real possibilities of current Romanian science and technology. During this year, their activities have resulted in the successful testing and construction of the ROBOPAS and VIPAS robots. But recently, this teacher-student collective has presented a new achievement of Romanian robotics--the pre-production testing of the R.E.H.-01 electrohydraulic robot--the fruit of a direct collaboration with specialists from the Grinding Machine Plant, and an argument for the integration of education with research and production. This robot is a new technical and scientific first for Romanian robotics. Motion is provided by linear, stepped electrohydraulic motors, designed and built in the laboratories of the machine-building technology department at the Mechanical Engineering School. These motors allow the robot to handle heavy loads, with linear displacement accuracies of the order of hundreths of millimeters, and with high reliability. It will be used in the complex automation of technical processes in the machine building industry; in a programmed mode, it can automatically feed semi-finished parts and tools to several machine-tools installed in flexible machining centers. For next year, a project is underway to upgrade the R.E.H.-01 to six degrees of freedom, thus enabling it to service 5-6 machine-tools in flexible machining centers on production lines. These are indeed remarkable ideas and options for engineering research, capable of offering the national economy technical achievements of international prestige. And in fact, the students' research at the Cluj institute is aiming

for these major goals. It does not limit itself to adaptation or labelling, but goes much further by documenting, testing, creating, and applying. Its characteristics are professional competence, and the option of high technology, economy, and constant innovation. At the same time, their research seeks industrial efficiency and quality, the development of technical intelligence, and higher labor productivity. We might point out that the noble orientation toward robotics research, and the understanding of its secrets and features, creates a symbiosis between specialists and their disciples, the students. In addition to the significant fact that the activity of students' scientific groups is focused on robotization, the degree projects of these students represent contributions and even innovations in robotics, with direct technologic applications. The work is carried out in joint teams, teachers and student-researchers (another aspect of effective integration), their basic concern being to satisfy economic needs according to contracts. Students naturally contribute both in research and design, and in the technical construction of the robots. A specific topic for improving the R.E.H.-01, in the students' scientific group, is to design and build a motion module with pneumatic support, for adapting the robot to central computer control. In addition, using modular elements and retaining the central control feature, the students are examining the possibility of varying robot types and dimensions to satisfy the concrete needs and conditions in economic units. As we were told by Prof Andrei Albu, principal coordinator of the robotics research and construction collective, the goal is to efficiently integrate the student group and designers in the extensive technical and scientific research program at the machine building department of the school, in order to train the students--the future specialists--at the level of world research in this important field of activity. Some of the students that are carrying out degree projects are: Ionel Onesc, Maria Szekely, Dinu Drulea, Vasile Selniceanu, Maria Marton, and Horatiu Petrehus, in their fifth year of machine-tool studies. It is notable that after graduation, the young engineers retain direct links from their jobs, with the research collective of the school, making their contributions through the real need for innovation in industrial units. Many of the school's projects are doctorate degree topics for the young specialists, who here, at the Cluj-Napoca Polytechnic Institute make real contributions to the continued improvement of production processes, raising the level of Romanian technical creativity and its international standing.

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